**CERTIFICATE OF ELECTRONIC TRANSMISSION**

I hereby certify that this correspondence for Application No. 10/555,713 is being electronically transmitted to Technology Center 2812, via EFS-WEB, on November 30, 2006.

/David H. Brinkman/ 11/30/06
David H. Brinkman, Reg. No. 40,532 Date

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicants: | Martin Hausner et al. |
| Serial No.: | 10/555,713 |
| Filed: | October 20, 2006 |
| Group Art Unit: | 2812 |
| Confirmation No.: | 9725 |
| Examiner: | Unknown |
| Title: | **RADIATION SENSOR, WAFER, SENSOR MODULE AND METHOD FOR MANUFACTURING A RADIATION SENSOR** (AS AMENDED) |
| Our Ref.: | BEET-14 |

Cincinnati, Ohio 45202 November 30, 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

**REQUEST FOR CORRECTED FILING RECEIPT**

Errors were noted in the Filing Receipt (copy attached) issued in connection with the above-identified application.

Applicants have filed on even date herewith a Second Preliminary Amendment (copy attached). Accordingly, with the amendments in the Second

Preliminary Amendment, the total number of claims is now 15. Also, with the amendments in the Second Preliminary Amendment, the Filing Fee Received is now $3,240.

Second, the Filing Receipt incorrectly identifies the title of the invention as claimed by Applicants in the above-identified application as being Radiation sensor, waver, sensor module, and method for the production a radiation sensor. A copy from the first page of the above-identified application as originally filed is attached hereto with the correct title as being Radiation Sensor, Wafer, Sensor Module and Method for Manufacturing a Radiation Sensor (as amended in the attached Second Preliminary Amendment).

Third, the Power of Attorney on the Filing Receipt is incorrect. The correct Power of Attorney should be identified by the Customer Number 26,875 as shown on the attached Declaration, Power of Attorney, and Petition as filed with the Response to Notification of Missing Requirements on October 20, 2006.

Lastly, the Foreign Applications on the Filing Receipt is incorrect. The Foreign Applications should be GERMANY 103 20 357.5 05/07/2003 as shown on the attached first page of the Published Application for WO 2004/099063 A2.

It is therefore respectfully requested that a new corrected Filing Receipt be issued to reflect the correct number of "Total Claims" as being 15, the correct "Filing Fee Received" as being $3,240, the correct "Title" as being Radiation Sensor, Wafer, Sensor Module and Method for Manufacturing a Radiation

Sensor, the correct "Power of Attorney" as being Customer Number 26,875 and the correct "Foreign Applications" as being GERMANY 103 20 357.5 05/07/2003.

It is believed that no fees are due in connection with this correction. However, the Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-3000.

Respectfully submitted,

WOOD, HERRON & EVANS, L.L.P.

By /David H. Brinkman/
David H. Brinkman
Reg. No. 40,532

2700 Carew Tower
441 Vine Street
Cincinnati, OH 45202
(513) 241-2324 - Voice
(513) 421-7269 - Facsimile

UNITED STATES PATENT AND TRADEMARK OFFICE



UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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| APPL NO. | FILING OR 371 (c) DATE | ART UNIT | FIL FEE REC'D | ATTY.DOCKET NO | DRAWINGS | TOT CLMS | IND CLMS |
|---|---|---|---|---|---|---|---|
| 10/555,713 | 10/20/2006 | 2812 | ~~1590~~ 3,240 | BEET-14 | 9 | (12) 15 | 2 |

**CONFIRMATION NO. 9725**

26875
WOOD, HERRON & EVANS, LLP
2700 CAREW TOWER
441 VINE STREET
CINCINNATI, OH 45202

**FILING RECEIPT**

*OC000000021035788*

Date Mailed: 11/07/2006

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

**Applicant(s)**

Martin Hausner, Wiesbaden, GERMANY;
Jurgen Schilz, Niedernhausen, GERMANY;
Fred Plotz, Taunusstein, GERMANY;
Hermann Karagozoglu, Wiesbaden, GERMANY;

**Power of Attorney:**

~~David Brinkman--40532~~ Customer No. 26,875

**Domestic Priority data as claimed by applicant**

This application is a 371 of PCT/EP04/04841 05/06/2004

**Foreign Applications** 10320357.5

GERMANY ~~103203575~~ 05/07/2003

**If Required, Foreign Filing License Granted:** 10/30/2006

**The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US10/555,713**

**Projected Publication Date:** 02/08/2007

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

Radiation sensor, ~~waver~~ wafer, sensor module, and method for ~~the production~~ manufacturing a radiation sensor

**Preliminary Class**

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## PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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## LICENSE FOR FOREIGN FILING UNDER
## Title 35, United States Code, Section 184
## Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The

date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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**NOT GRANTED**

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

**CERTIFICATE OF ELECTRONIC TRANSMISSION**

I hereby certify that this correspondence for Application No. 10/555,713 is being electronically transmitted to Technology Center 2812, via EFS-WEB, on November 30, 2006.

/David H. Brinkman/ 11/30/06
David H. Brinkman, Reg. No. 40,532 Date

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant(s): | Martin Hausner et al. |
| Serial No.: | 10/555,713 |
| Filed: | October 20, 2006 |
| Art Unit: | 2812 |
| Confirmation No.: | 9725 |
| Examiner: | Unknown |
| Title: | **RADIATION SENSOR, WAFER, SENSOR MODULE AND METHOD FOR MANUFACTURING A RADIATION SENSOR** (AS AMENDED) |
| Our Ref. No.: | BEET-14 |

Cincinnati, OH November 30, 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**SECOND PRELIMINARY AMENDMENT**

Sir:

Prior to examination of the above-identified application, please amend the application as follows:

**Amendments to the Title** begin on page 2 of this paper.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 3 of this paper.

**Remarks/Arguments** begin on page 9 of this paper.

**Amendments to the Title:**

RADIATION SENSOR, ~~WAVER~~ WAFER, SENSOR MODULE AND METHOD FOR MANUFACTURING A RADIATION SENSOR

This listing of claims will replace all prior versions, and listings, of claims in the application:

**In the Claims:**

1-15. Canceled.

16. (PREVIOUSLY PRESENTED) A radiation sensor comprising:

a support;

a cavity which may be a recess or a through hole formed in one surface of the support;

a sensor element formed above the cavity, preferably on a membrane covering the cavity; and

electric terminals for the sensor element, characterised in that:

the cavity in the surface of the support has a round or oval contour;

the side wall of the cavity is rectangular to the support surface; and

the cavity is formed through dry etching.

17. (PREVIOUSLY PRESENTED) A radiation sensor according to claim 16, characterised in that the support has a rectangular and particularly a square contour.

18. (PREVIOUSLY PRESENTED) A radiation sensor according to claim 17, characterised in that one or more electric terminals are provided in a corner section of the sensor.

19. (PREVIOUSLY PRESENTED) A radiation sensor according to claim 16, characterised in that the sensor element is a thermopile.

20. (PREVIOUSLY PRESENTED) A radiation sensor according to claim 16, characterised in that a plurality of sensor elements are formed above one cavity.

21. (PREVIOUSLY PRESENTED) A radiation sensor according to claim 16, characterised by one or more of the following features:

the membrane material comprises a dielectric, particularly silica and/or silicon nitride;

under the membrane an etching stop layer containing an oxide, particularly silica, is provided; and

the support material contains silicon and/or GaAs and/or a semiconductor material.

22. (PREVIOUSLY PRESENTED) A radiation sensor according to claim 16, characterised by one or more of the following dimensions:

support height H: more than 50 μm, preferably more than 200 μm, less than 1,500 μm, preferably less than 600 μm;

support edge length L: less than 2 mm, preferably less than 1.5 mm;

cavity diameter D: more than 55%, preferably more than 65% and/or less than 90%, preferably less than 80% of the support edge length; and

membrane thickness D: less than 3 μm, preferably more than 0.1 μm.

23. (PREVIOUSLY PRESENTED) A wafer comprising a plurality of blanks for radiation sensors according to one or more of the preceding claims formed on it, characterised in that the blanks are arranged on the wafer in a rectangular, rhombic, triangular or hexagonal grid.

24. (PREVIOUSLY PRESENTED) A sensor array comprising a plurality of radiation sensors according to one or more of claims 16 to 22.

25. (PREVIOUSLY PRESENTED) A sensor array according to claim 24, characterised in that a plurality of radiation sensors are arranged in two or more rows and in two or more columns.

26. (CURRENTLY AMENDED) A sensor module comprising:

a radiation sensor according to one or more of claims 16 to 22 ~~or a sensor array according to claims 24 or 25~~;

a housing in which the radiation sensor ~~or the sensor array~~ is accommodated;

an optical window in the housing; and

electric terminals protruding from the housing, said electric terminals being connected to the terminals.

27. (PREVIOUSLY PRESENTED) A sensor module according to claim 26, characterised by an optical projection element, particularly a lens or a mirror.

28. (PREVIOUSLY PRESENTED) A method for manufacturing a radiation sensor comprising the steps:

production of a plane wafer;

application of an etching stop layer on a first surface of the wafer and formation of a mechanically stable membrane on top of it;

application of an etching mask having one or more openings with oval or round contours on the second surface of the wafer; and

dry etching of cavities in the wafer from the second surface in the direction towards the etching stop layer such that the side wall of the cavity is rectangular to the support surface.

29. (NEW) A sensor module comprising:

a sensor array according to claim 24;

a housing in which the sensor array is accommodated;

an optical window in the housing; and

electric terminals protruding from the housing, said electric terminals being connected to the terminals.

30. (NEW) A sensor module according to claim 29, characterised by an optical projection element, particularly a lens or a mirror.

## REMARKS

Claims 1-15 have been canceled without prejudice or disclaimer. Claim 26 has been amended. New claims 29 and 30 have been added.

The title has been amended to correct a typographical error.

In accordance with 37 C.F.R. §1.16(i), Applicants have submitted herewith the $1,650 fee for the thirty three (33) extra claims. If any additional fees are necessary to complete this communication, the Commissioner is hereby authorized to charge any underpayment or fees associated with this communication or credit any overpayment to Deposit Account No. 23-3000.

Respectfully submitted,

WOOD, HERRON & EVANS, L.L.P.

By /David H. Brinkman/
David H. Brinkman
Reg. No. 40,532

2700 Carew Tower
441 Vine Street
Cincinnati, OH 45202
(513) 241-2324 - Voice
(513) 421-7269 - Facsimile

# RADIATION SENSOR, WAVER, SENSOR MODULE AND METHOD FOR MANUFACTURING A RADIATION SENSOR

The invention relates to a radiation sensor, a waver, a sensor module and a method for manufacturing a radiation sensor according to the preambles of the independent claims.

A class of radiation sensors may be designed so that incident radiation, for example infrared radiation ($\lambda > 700$ nm), causes changes by heating a sensor element which generates an electric signal in accordance with the temperature or a change of the temperature. Since the temperature change will frequently be relatively small a good thermal isolation of the actual sensor element is required to restrict the diffusion of the comparatively low incident amount of heat to non-heat sensitive regions (the thermal short-circuit) to a minimum. It is known to provide a thin membrane on a frame and to form the sensor element on said thin membrane so that the sensor element itself will not directly contact massive heat valleys. A typical embodiment is shown in Fig. 11: a frame, for example of silicon, surrounds a rectangular cavity 112 which may as well be a through hole. A membrane 113 is stretched and fixed above the cavity 112, a sensor element 104 being mounted on the membrane so that the electrically effective area is located on the membrane and not above a massive heat valley. Contacts 105 reach under the poles of the sensor element 114 and can be used to electrically extract the resulting electric signals. The bonding pads 115a, b of the contacts are located above the frame, typically above a broadened bar 101a of the frame, so that the membrane 113 is not damaged during the bonding process. Typically the dimensions of the sensor elements include edge lengths of a few millimetres, cavity diameters of 50 to 90 % of the edge lengths of the sensor elements and membrane thicknesses of a few micrometers. A disadvantage of this construction is that, due to

Express Mail No. EV562644494US Attorney Docket No. BEET/14

## DECLARATION, POWER OF ATTORNEY, AND PETITION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

## RADIATION SENSOR, WAVER, SENSOR MODULE AND METHOD FOR MANUFACTURING A RADIATION SENSOR

the specification of which (check one below):

( ) is attached hereto.

( ) was filed on ___ as Application Serial No. ___ or Express Mail No. ___, and was amended on ___ (if applicable).

(√) was filed on May 6, 2004 as PCT International Application No. PCT/EP2004/004841, and as amended by Preliminary Amendment filed on even date herewith.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

| Prior Foreign Application(s) | | | Priority Claimed? |
|---|---|---|---|
| DE 103 20 357.5 (Number) | Germany (Country) | 7/5/2003 Day/Month/Year Filed | (U) Yes ( ) No |
| (Number) | (Country) | Day/Month/Year Filed | ( ) Yes ( ) No |
| (Number) | (Country) | Day/Month/Year Filed | ( ) Yes ( ) No |

I hereby claim the benefit under Title 35, United States Code, §120 and/or §119(e) of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application and the national or PCT international filing date of this application.

| (Serial No.) | (Filing Date) | (Status: Patented, Pending, or Abandoned) |
|---|---|---|
| (Serial No.) | (Filing Date) | (Status: Patented, Pending, or Abandoned) |
| (Serial No.) | (Filing Date) | (Status: Patented, Pending, or Abandoned) |

I hereby appoint the practitioners associated with the customer number 26,875, as my attorneys or agents, with full power of substitute and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Address all correspondence and telephone calls to

David H. Brinkman

Address of customer number 26,875
Telephone (513) 241-2324

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of Inventor Martin Hausner

Inventor's Signature Martin Hausner Date 21 Nov 2005

Residence City/State Wiesbaden, Deutschland Citizenship Deutschland

Post Office Address Sooderstrasse 63, 65193 Wiesbaden, Deutschland

Full name of Inventor Jurgen Schilz

Inventor's Signature Date Nov 14, 2005

Residence City/State Niedernhausen, Deutschland Citizenship Deutschland

Post Office Address Am Schafersberg 1 d, 65527 Niedernhausen, Deutschland

Full name of Inventor Fred Pletz

Inventor's Signature Date Nov. 14. 2005

Residence City/State Taunusstein Citizenship Deutschland

Post Office Address Dietrich Bonhoffer Strasse 14, 65232 Taunusstein, Deutschland

Full name of Inventor Hermann Karagozoglu

Inventor's Signature Date 11.14.2005

Residence City/State Wiesbaden, Deutschland Citizenship Deutschland

Post Office Address Moabiter Strasse 3, 65205 Wiesbaden, Deutschland

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

(43) Internationales Veröffentlichungsdatum
18. November 2004 (18.11.2004)

PCT

(10) Internationale Veröffentlichungsnummer
WO 2004/099063 A2

(51) Internationale Patentklassifikation[7]: B81B 3/00, H01L 35/02, 35/32, G01J 5/12

(21) Internationales Aktenzeichen: PCT/EP2004/004841

(22) Internationales Anmeldedatum:
6. Mai 2004 (06.05.2004)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
103 20 357.5 7. Mai 2003 (07.05.2003) DE

(71) Anmelder *(für alle Bestimmungsstaaten mit Ausnahme von US)*: **PERKINELMER OPTOELECTRONICS GMBH & CO. KG** [DE/DE]; Wenzel-Jaksch-Strasse 31, 65199 Wiesbaden (DE).

(72) Erfinder; und

(75) Erfinder/Anmelder *(nur für US)*: **HAUSNER, Martin** [DE/DE]; Sooderstrasse 63, 65193 Wiesbaden (DE). **SCHILZ, Jürgen** [DE/DE]; Am Schäfersberg 1 d, 65527 Niedernhausen (DE). **PLOTZ, Fred** [DE/DE]; Dietrich Bonhöffer Strasse 14, 65232 Taunusstein (DE). **KARAGÖZOGLU, Hermann** [DE/DE]; Moabiter Strasse 3, 65205 Wiesbaden (DE).

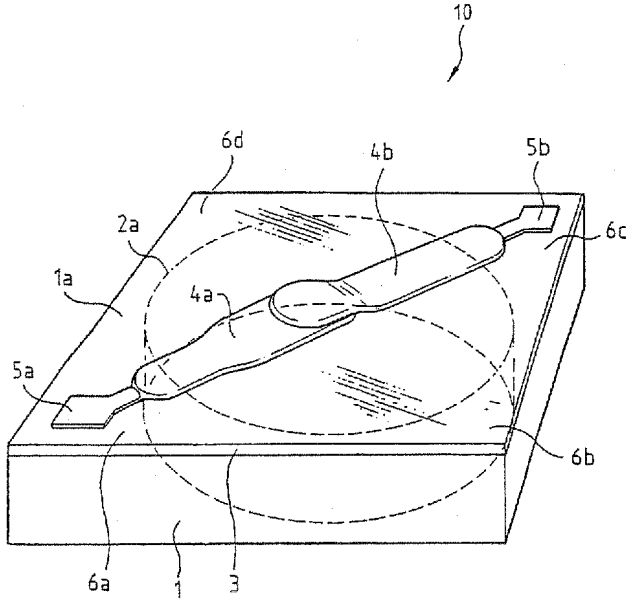
(74) Anwalt: **BEETZ & PARTNER**; Steinsdorfstrasse 10, 80538 München (DE).

(81) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare nationale Schutzrechtsart)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,

*[Fortsetzung auf der nächsten Seite]*

(54) Title: RADIATION SENSOR, WAFER, SENSOR MODULE, AND METHOD FOR THE PRODUCTION OF A RADIATION SENSOR .

(54) Bezeichnung: STRAHLUNGSSENSOR, WAFER, SENSORMODUL UND VERFAHREN ZUR HERSTELLUNG EINES STRAHLUNGSSENSORS




(57) Abstract: Disclosed is a radiation sensor (10) comprising a support (1), a lowered area (2) that is embodied within a surface of the support (1) and can represent a depression or a through hole, a sensor element (4, 4a, 4b) which is embodied above the lowered area (2), preferably on a membrane (3) spanning the lowered area (2), and electrical contacts (5, 5a, 5b) for the sensor element (4, 4a, 4b). The lowered area (2) has an entirely or partly rounded contour (2a) within the surface of the support (1).

*[Fortsetzung auf der nächsten Seite]*

WO 2004/099063 A2